

A NEW GENUS AND SPECIES OF POLYCHAETE,
BOLLANDIA ANTIPATHICOLA
(NEREIDOIDEA: SYLLIDAE),
FROM BLACK CORAL

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Abstract.—A new genus and species of syllid polychaete, *Bollandia antipathicola*, is described. This is the first syllid species to be found in association with an antipatharian coral. It differs from other Syllidae in having one pair of peristomial cirri and two pairs of tentacular cirri (i.e., a total of three pairs of cirri on the anterior end), lacking palps and antennae, and in having few specialized stout setae. The species is hermaphroditic and possesses many paired ventral reproductive papillae that may be used in copulation or for ejecting spermatophores.

Routine sorting of a collection of benthic invertebrates from 52–61 m off Okinawa, Japan, yielded an unusual polychaete that was attached to Black Coral, *Antipathes* sp. The species clearly belonged to the order Phyllodocida as it had a muscular, axial type of eversible pharynx, unlike the ventral type found in other polychaete orders having a pharynx such as the Eunicida and Amphinomida (Dales 1962, Orrhage 1973). Further, the species was suspected of belonging to the Nereidoidea as it had at least two pairs of tentacular cirri presumably resulting from the cephalization of the parapodia of the first two segments, as for example in some species of the Hesionidae (Glasby 1993). The Nereidoidea currently contain six families: the Chrysopetalidae, Hesionidae, Nautiliniellidae, Nereididae, Pilargidae, and Syllidae (Glasby 1993; Glasby & Fauchald 1991). The species could not initially be assigned to any of these based on external features; however, a histological study revealed an axial pharynx that was fully differentiated (sensu Glasby 1993), that is one having a proventriculus and muscular ventriculus, a synapomorphy of the Syllidae.

The association between the new syllid

polychaete and the *Antipathes* may be commensal, although there is insufficient information available on the biology of either organism to be certain. Commensalism has been reported previously among the Syllidae with species associated with poriferan hosts (Cognetti 1957, Pearse 1934), ophiuroid hosts (e.g., Hendler & Meyer 1982) and a eunicid polychaete (Hempelmann 1931). Although there are several records of cnidarian hosts (Utinomi 1956, Hartmann-Schröder 1960, Laubier 1960, Wright & Woodwick 1977, Hartmann-Schröder 1991, 1992) there appear to be no previous records of syllids being associated with antipatharian corals (Anthozoa: Ceriantharia). However, Pettibone (1991) recorded four polynoid species from antipatharians. Further, Pettibone (and references therein) found that the commensal annelids could induce the formation of tunnels in the coenenchyme of the main stems of the coral: tunnels were formed by anastomosed twigs. No such modification to the coral was observed in the present study.

Other commensal nereidoids include *Antonbruunia viridis* Hartman & Boss, recently moved to the Pilargidae (Glasby 1993) and species of the Nautiliniellidae all of which

are commensals or parasites of bivalve molluscs (Hartman & Boss 1965, Miura & Laubier 1989, Blake 1993).

Specimens described in this paper have been deposited with the National Museum of Natural History, Smithsonian Institution (USNM), Natural History Museum, London (BMNH), and the Australian Museum (AM).

Family Syllidae Grube, 1850

Bollandia, new genus

Type species.—*Bollandia antipathicola*, new species.

Diagnosis.—Antennae absent; palps absent; nuchal organs not externally exposed (sensu Glasby 1993); three pairs of appendages on anterior end, most probably representing one pair of peristomial cirri and two pairs of tentacular cirri (i.e., parapodia of segments 1 & 2 cephalized during ontogeny; but see Remarks); pharyngeal apparatus consisting of sinuous, unarmed pharynx, and a barrel-shaped proventriculus; notopodia and notosetae absent; neurosetae simple, occur in the sub-acicular position only; anal cirri paired.

Etymology.—The genus has feminine gender, and is named in honor of R.F. Bolland who collected the specimens. The specific name refers to the genus of Black Coral, *Antipathes*, on which the new species was found.

Bollandia antipathicola, new species (Figs. 1A–H; 2A–D)

Material examined.—All material from Japan, Okinawa, Horseshoe Cliffs, 1 km WNW Onna village, 26°30.0'N, 127°50.9'E, coll. R. F. Bolland. Holotype: Stn RFB 1240, 61 m, coll. 5 Aug 1984 (USNM 169157). Paratypes: Stn RFB 1240, 61 m, coll. 5 Aug 1984, 7 specimens (USNM 169158), 2 specimens mounted for SEM (USNM 169159), 2 specimens sectioned (USNM 169160), 2 specimens (AM W21804), 2 specimens

(BMNH 1994.3202–3203); Stn RFB 1235, 57.9 m, coll. 3 Aug 1984, 2 specimens (USNM 169161); Stn 1243, 64.0 m, coll. 10 Aug 1984, 6 specimens (USNM 169162); Stn RFB 1276, 51.8 m, coll. 10 Oct 1984, 1 specimen (USNM 169163); Stn RFB 1974, 61 m, coll. 28 Aug 1988, 2 specimens (USNM 169164), 1 specimen mounted for SEM (USNM 169165).

Description.—Holotype 73 setigers, 6.0 mm long, 0.4 mm wide. Paratype material ranged in size from 16 setigers, 1.3 mm long, 0.2 mm wide (USNM 169165) to 47 setigers, 6.2 mm long, 0.3 mm wide (USNM 169160). Body approximately uniform in width throughout, highly arched dorsally particularly over setigers 1–4 (Figs. 1A, C) which carry the pharyngeal apparatus, flat-concave ventrally with parapodia directed ventrolaterally (Figs. 1B, 2D). Preserved material with diffuse brown pigment on ventral surface of setiger 4 (absent in smaller paratypes) and from setiger 8 to near pygidium, particularly intense around base of ventral cirri. Dorsum, parapodia and cirri covered with clumps of long cilia (Fig. 1A).

Prostomium small, ill-defined, directed anteroventrally, lacking antennae or palps (Figs. 1B, 2D). Eyes very small, red, two pairs, posterior pair slightly further apart than anterior pair. Peristomium indistinct, carrying a pair of smooth peristomial cirri (C1), about twice width of prostomium, directed anteriorly (Fig. 2D). First two segments cephalized, fused together and with peristomium, ventral surface slightly raised above level of succeeding segments (Fig. 1B); first pair of tentacular cirri (C2) smooth, lacking aciculae, slightly dorsally displaced, similar in shape though slightly longer than peristomial cirri, basally with pair of minute vestigial ventral cirri (V1; not visible in holotype); second pair of tentacular cirri (C3) also smooth and lacking aciculae, similar in size and shape to C2, basally with a pair of small vestigial ventral cirri (V2; Figs. 1B, 2D).

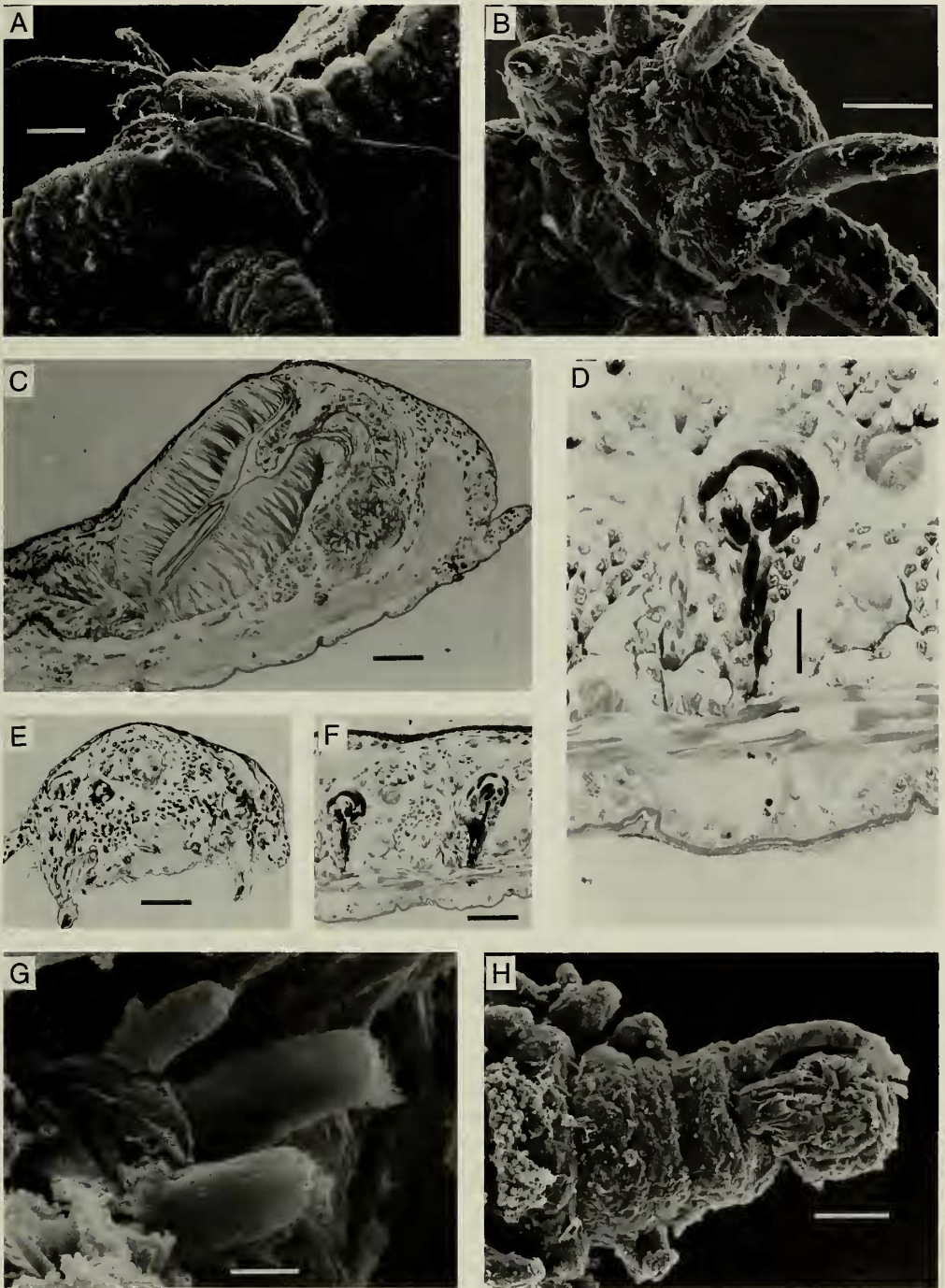


Fig. 1. A–H: *Bollandia antipathicola*, new genus, new species, Paratypes (USNM 169160): A, in situ on *Antipathes* sp.; B, anterior end, anteroventral view; C, anterior end, longitudinal section; D, midbody, longitudinal section; E, midbody, transverse section; F, sperm containing tubules, midbody; G, reproductive papillae, midbody; H, posterior end, ventral view. Scale bars: 100 μm (A, C, D, E), 40 μm (B, H), 20 μm (F), 5 μm (G).

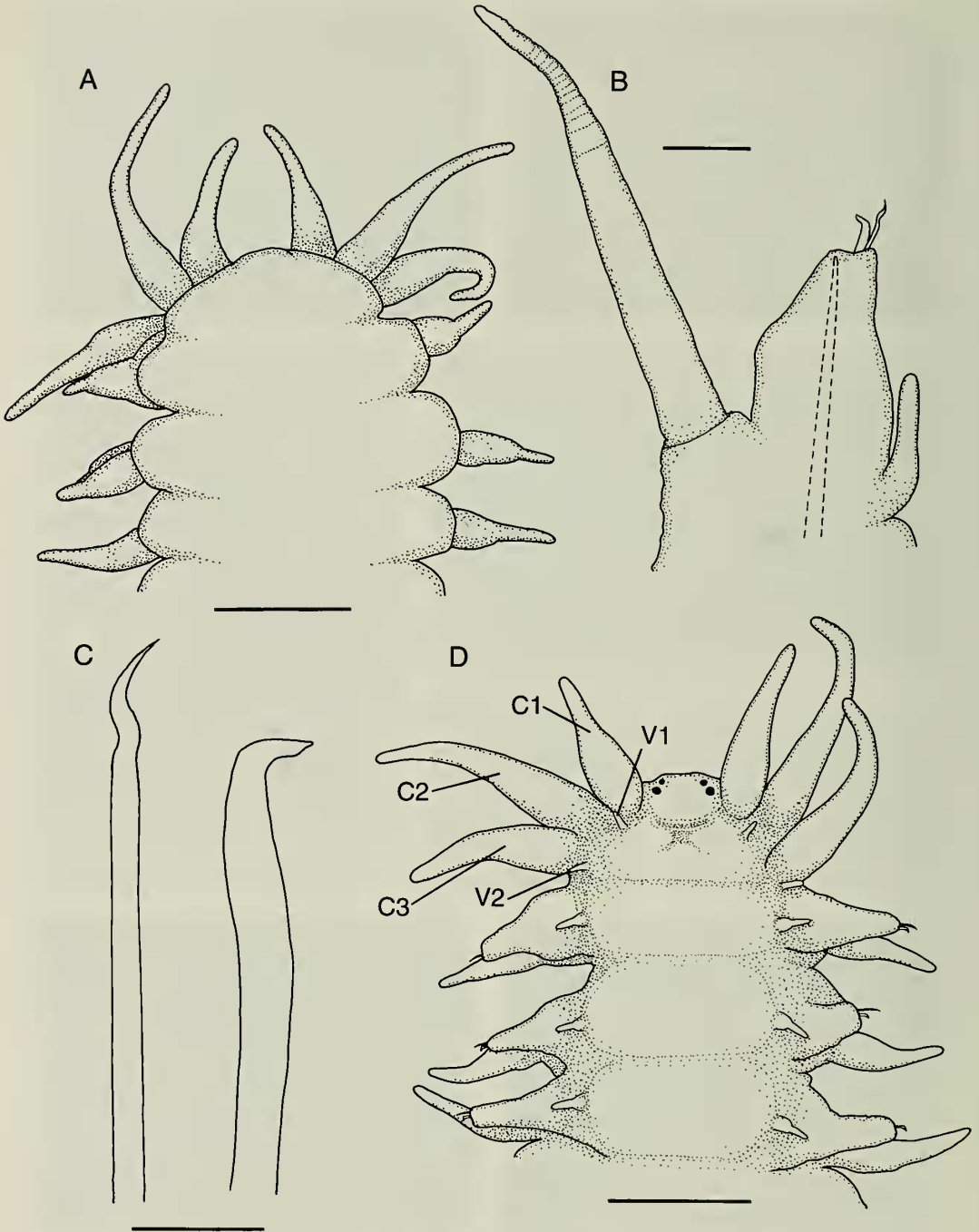


Fig. 2. A–D: *Bollandia antipathicola*, new genus, new species: A, Paratype (USNM 169158) anterior end, dorsal view; B, Holotype, parapodium from midbody, anterior view; C, Holotype, setae from parapodia of midbody; D, anterior end, ventral view, composite illustration compiled from 3 paratypes (USNM 169158) [C1 = peristomial cirri; C2, C3 = tentacular cirri; V1–3 = ventral cirri]. Scale bars: 0.10 mm (A, D), 0.05 mm (B), 0.02 mm (C).

Pharyngeal apparatus housed in anterior dorsally vaulted region (Fig. 1C). Pharynx cylindrical, extending back to about second setiger, sinuous, apparently unarmed (although not dissected). Proventriculus barrel-shaped, extending from pharynx back to about setiger 4, with about 28–35 groups of radial muscle columns (Fig. 1C).

Segment 3 first setigerous. Parapodia consisting of a single conical neuropodial lobe supported by one acicula and carrying two setae (Figs. 2B, D). Dorsal cirri atop very short cirrophore, tapered, faintly articulated distally, with very closely spaced articles; about equal in length to neuropodial lobe. Ventral cirri very slender, adpressed to parapodia, about $\frac{1}{2}$ ($\frac{1}{4}$ – $\frac{1}{2}$) length of neuropodial lobe (Figs. 2B, D). Subsequent parapodia similar to first, except length of dorsal cirri 1–3 times length of corresponding neuropodial lobes, generally increasing slightly in length posteriorly, though longer ones occurring every 4–7 segments. Setae of two types, both only slightly less stout than corresponding acicula: highly tapered flail-tipped setae, slightly bent near tip; and slightly stouter setae, distally bent at right-angles forming beak-like tip (Fig. 2C).

Pygidium swollen, glandular, pair of conical ventrolateral anal cirri (Fig. 1H; absent in holotype).

Reproductive papillae present on elevated pads at ventral base of parapodia (Fig. 1G); resemble ventral cirri in both size and shape. Beginning on setigers 2–5 reproductive papillae extend posteriorly to last setigers. Papillae fed by internal tubules filled with mature sperm (Figs. 1D–F). Perhaps also early stages of sperm present, but not classical spermatids and no intermediate stages between these early stages and mature stages. Oocytes spherical, unpigmented, ranged in diameter from about 10–50 μm (1 specimen, USNM 169163), present in all specimens in posterior half of body from setigers 9–11 to near pygidium.

Remarks. — The species is hermaphrodit-

ic, although it is difficult to estimate from so few specimens whether it is a sequential or a simultaneous hermaphrodite. Although resembling some types of seminal receptacles (spermathecae), the ‘internal tubules’ are more likely to represent seminal vesicles or testes since they appear to empty to the exterior via reproductive papillae. Reproductive papillae may be used for direct copulation, as in *Pisione remota* (Stecher 1968), although no gametal pores could be identified on any specimen. Alternatively they may function for ejecting spermatophores that could be fixed to (and later penetrate) the body of another individual, as in *Hesionides arenaria* (Westheide 1967).

The precise nature of the anterior end appendages is uncertain, since the distinction between anterior segments, peristomium and prostomium is unclear. However, long, slender appendages in the Nereidoidea are more likely to represent cirri, either of peristomial or segmental origin, than antennae or palps. Assuming that the presence of the vestigial ventral cirri (Fig. 2D) at the ventral base of the anterior end cirri indicates a segmental origin, then clearly two segments have been cephalized. The question is whether the first pair of ventral cirri (V1) is associated with the first (C1) or the second (C2) pair of cirri. If associated with C1 then the first pair are tentacular cirri derived from segment 1 and the second and third pairs (C2, C3) are also tentacular cirri perhaps both derived from segment 2 (Fig. 2D). If this were the case then *Bollandia* would lack peristomial cirri. However, a more likely hypothesis, and the one proposed here, is that V1 is associated with C2, implying that C1 are peristomial cirri and the C2 and C3 are derived from segments 1 and 2 respectively.

Most Syllidae have one or two pairs of anterior end cirri (Fauchald 1977, Garwood 1991). Strictly speaking the cirri are peristomial in origin and should therefore be referred to as peristomial cirri (Glasby

1993), although the term tentacular cirri has also been used in the literature. Exceptions are those genera that lack peristomial cirri altogether, including *Exogonella* Hartman, *Fauvelia* Gravier, *Haplosyllides* Augener, and *Nudisyllis* Knox & Cameron; *Irmula* Ehlers supposedly has six pairs of tentacular cirri. *Bollandia antipathicola*, new species, differs from these and other species of Syllidae in having one pair of peristomial cirri and two pairs of tentacular cirri (=three pairs of anterior end cirri). In addition it lacks antennae and palps and has few specialized stout setae. The lack of palps appears to have been recorded for only one other syllid genus, *Haplosyllides* Augener. *Haplosyllides* differs from *Bollandia* in having three antennae and lacking both peristomial and tentacular cirri (Augener 1922).

Most Syllidae undergo some form of structural (epitokous) modification associated with sexual maturity (Garwood 1991). Neither schizogamy, in which sexual individuals are budded off from the adult, nor epigamy, in which the whole animal undergoes modification were observed in the present specimens of *Bollandia*. Like the new *Bollandia* species, palps are often absent in epigamous (=epitokous) syllids (Estapé & San Martín 1991). However, the new species can not represent an epitokous syllid since epitokes generally lack peristomial cirri, have enlarged eyes and many capillary (swimming) setae and their bodies are often turgid with gametes.

The species resembles most closely those of the subfamily Eusyllinae, which was recently defined by Garwood (1991). In common with the Eusyllinae, *Bollandia* has smooth or indistinctly articulated dorsal cirri and cirri of the anterior end, the presence of ventral cirri, and segmental ciliation that is retained in adults. It differs from the Eusyllinae however, in having 3 pairs of anterior end cirri (cf. two pairs, according to Garwood) and in lacking palps, although other members of the Eusyllinae may have reduced palps (Garwood 1991).

In my opinion the subfamilial groupings within the Syllidae remain controversial (see also Fauchald 1977) despite the findings of Garwood (1991), which support the traditional four subfamilial groupings. The Syllidae have never been subject to any sort of rigorous phylogenetic analysis and therefore the Eusyllinae, along with other syllid subfamilies, may not constitute a monophyletic group. Until monophyletic groups within the Syllidae can be identified, the phylogenetic relationships of *Bollandia* must remain obscure.

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